In The Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

1. (Currently Amended) A method of preparing percarbonic acid or a composition comprising same, the method comprising the step of contacting hydrogen peroxide and carbon dioxide in the presence of at least one of a plasma or UV radiation and under conditions conducive to formation of percarbonic acid.

2. (Original) The method of claims 1, wherein the hydrogen peroxide is an aqueous hydrogen peroxide solution.

3-4. (Cancelled).

5. (Original) The method of claim 1, wherein the hydrogen peroxide and carbon dioxide are contacted in the presence of a plasma.

6. (Original) The method of claim 1, wherein the hydrogen peroxide and carbon dioxide are contacted in the presence of UV radiation.

7. (Original) The method of claim 1, wherein the hydrogen peroxide and carbon dioxide are contacted in the presence of a plasma and UV radiation.

8. (Currently Amended) The method of ~~any one of claims 5 to 7~~claim 1, wherein the hydrogen peroxide and carbon dioxide are contacted at a temperature of between about 5 and 200°C and a pressure of between 4 and 10 MPa.

9 (Original) The method of claim 2, wherein the aqueous solution of hydrogen peroxide is contacted with liquid or supercritical carbon dioxide under conditions conducive to formation of percarbonic acid.

10. (Original) The method of claim 9, wherein the aqueous hydrogen peroxide is contacted with supercritical carbon dioxide.

11. (Cancelled).

12. (Original) The method of claim 9, wherein the aqueous hydrogen peroxide is contacted with liquid carbon dioxide.

13. (Cancelled).

14. (Original) The method of claim 9, wherein the aqueous solution of hydrogen peroxide is contacted with liquid or supercritical carbon dioxide in a continuous flow extraction apparatus.

15-25. (Cancelled).

26. (Original) A method of cleaning a substrate, the method comprising the step of contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to removing contaminants from the substrate.

27. (Original) The method of claim 26, wherein the contaminants are at least one of biological, organic, inorganic or particulate residues.

28. (Currently Amended) A method of <u>at least one of disinfecting or</u> sterilizing a substrate, the method comprising the step of contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to <u>disinfecting or</u> sterilizing the substrate.

29. (Currently Amended) A method of cleaning and at least one of disinfecting or sterilizing a substrate, the method comprising the step of contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to removing contaminants from the substrate and conducive to disinfecting or sterilizing the substrate.

30. (Cancelled).

31. (Original) The method of claim 29, wherein the contaminants are biological, organic, inorganic, or particulate residues.

32-33. (Cancelled).

34. (Currently Amended) The method of ~~claim 33~~claim 29, wherein the fluid comprises liquid or supercritical carbon dioxide.

35. (Currently Amended) The method of ~~any one of claims 26-33~~claim 28, wherein the fluid and the substrate are contacted with a plasma.

36-38. (Cancelled).

39. (Original) The method of claim 35, wherein the plasma is an UV irradiated and weakly ionized plasma.

40. (Cancelled).

41. (Currently Amended) The method of ~~any one of claims 26-33~~claim 28, wherein the fluid and the substrate are irradiated with UV light during at least a portion of the contacting step.

42. (Original) The method of claim 41, wherein at least about 40% of the UV irradiation has a wave length of less than 300 nm.

43-44. (Cancelled).

45. (Original) The method of claim 41, wherein the UV irradiation is continuous or intermittent.

46-51. (Cancelled).

52. (Currently Amended) The method of ~~any one of claims 26-31~~claim 28, wherein the fluid further comprises at least one additive.

53. (Currently Amended) The method of claim 52, wherein the additive is selected from the group consisting of inert gases, ozone, nitrogen, noble gases, carbon monoxide, carbon tetrachloride, carbon tetrafluoride, hydrogen peroxide, and mixtures thereof.

54. (Currently Amended) The method of ~~any one of claims 26-31~~claim 28, wherein the substrate is translated in at least one direction during at least a portion of the contacting step.

55. (Original) The method of claim 54, wherein the substrate is translated in at least two dimensions during at least a portion of the contacting step.

56-57. (Cancelled).

58. (Currently Amended) The method of ~~any one of claims 26-31~~claim 28, wherein the method further comprises the step of drying the substrate after contacting the substrate with the fluid.

59. (Currently Amended) The method of ~~any one of claims 26-31~~claim 28, wherein the substrate is composed of a metal, a ceramic, a glass, a polymer or a combination thereof.

60. (Currently Amended) The method of claim 59, wherein the substrate is composed of stainless steel, platinum, iridium, palladium, nickel, gold, titanium, zirconium, inconel, cobalt steel, aluminum, copper, zinc, bronze, metal plating, metal foams, magnetic substrates, polypropylene, neoprene, Buna-N, Butyl Rubber, silicones, Viton, EPDM, polyurethane, polyetheretherketone, nylon, Teflon, Tyvek, biocompatible fabrics and polymers, cellulose acetates, PVC, CPVC, polycarbonate, Delrin, polyetherimide, polyamide, polyimide, silicon dioxide, borosilicate, quartz, alumina, silica, borosilicate, zirconium oxide, silicon carbide, boron nitride, magnetic ceramics, superconductive ceramics, or combinations thereof.

61-62. (Cancelled).

63. (Currently Amended) The method of ~~any one of claims 26-31~~claim 28, wherein the substrate is a medical device, a biomedical implant, a semiconductor wafer, an electronic device, or optical element.

64. (Original) The method of claim 63, wherein the substrate is a medical device.

65. (Original) The method of claim 64, wherein the substrate is a reusable endoscope.

66. (Original) A method of cleaning a substrate comprising the steps of

applying a translational force to the substrate; and

contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to removing contaminants from the substrate.

67. (Cancelled).

68. (Currently Amended) ~~A~~ The method of ~~cleaning a substrate~~ claim 66, wherein the method comprises ~~comprising~~ the steps of

applying a translational force and ultrasound to the substrate; and

contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to removing contaminants from the substrate.

69. (Currently Amended) The method of claim 66 ~~or claim 68~~, wherein the fluid is contacted with the substrate while the translational force is applied thereto.

70. (Currently Amended) The method of ~~any one of claims 66-68~~claim 66, wherein the contaminants are biological, organic, inorganic, or particulate residues.

71. (Currently Amended) A method of at least one of disinfecting or sterilizing a substrate, the method comprising the steps of

applying a translational force to the substrate; and

contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to sterilizing the substrate.

72. (Cancelled).

73. (Currently Amended) ~~A~~ The method ~~of disinfecting or sterilizing a substrate comprising~~ of claim 71, wherein the method comprises the steps of

applying a translational force and ultrasound to the substrate; and

contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to removing contaminants from the substrate.

74. (Cancelled).

75. (Original) A method of cleaning and sterilizing a substrate, the method comprising the steps of

applying a translational force to the substrate; and

contacting a substrate with a fluid comprising percarbonic acid under conditions conducive to removing contaminants from the substrate and conducive to sterilizing the substrate.

76. (Cancelled).

77. (Original) The method of claim 75, wherein the contaminants are biological, organic, inorganic, or particulate residues.

78. (Original) The method of claim 75, wherein the translational force is a centripetal or Coriolis force.

79-80. (Cancelled).

81. (Original) The method of claim 75, wherein the fluid and the substrate are contacted with a plasma.

82-83. (Cancelled).

84. (Original) The method of claim 75, wherein the fluid and the substrate are irradiated with UV light during at least a portion of the contacting step.

85. (Original) The method of claim 84, wherein at least about 40% of the UV irradiation has a wave length of less than 300 nm.

86. (Cancelled).

87. (Original) The method of claim 75, wherein the fluid further comprises at least one additive.

88. (Cancelled).

89. (Original) An apparatus for cleaning or sterilizing a substrate with percarbonic acid comprising a cleaning chamber, a UV irradiation source, an electrical field generator, a device capable of applying a translational force to the substrate, and a percarbonic acid generator or percarbonic acid source.

90. (Currently Amended) A method for monitoring *in-situ* a process for cleaning or sterilization ~~method of any one of claims 26-88~~a test substrate, the method comprising the steps of:

providing a test substrate having at least one chemical or biological contaminant deposited thereon;

measuring the UV-Vis spectrum of the test substrate prior to cleaning or sterilizing;

contacting the test substrate with the fluid comprising percarbonic acid under conditions conducive to cleaning or sterilizing the substrate;

measuring the UV-Vis spectrum of the test substrate periodically during and after contacting the test substrate with the fluid; and

comparing the periodic UV-Vis spectra against the pre-cleaning or pre-sterilizing UV-Vis spectrum to monitor the cleaning or sterilization process.

91. (New) The method of claim 71, wherein the fluid is contacted with the substrate while the translational force is applied thereto.

92. (New) The method of claim 71, wherein the translational force is a centripetal or Coriolis force.